

Notice of Allowability

Application No.

09/853,622

Examiner

Craig A. Renner

Applicant(s)

HAYASHI ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to paper(s) filed 09 December 2004 and 18 November 2004.
2. ☒ The allowed claim(s) is/are 1,4-6,10,20 and 21 (renumbered 1-7, respectively).
3. ☒ The drawings filed on 23 January 2004 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date 09 December 2004
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

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1. Claim 1 is generic and allowable. Accordingly, the restriction requirement as to the encompassed species is hereby withdrawn and claims 4-6, 10 and 20-21, directed to one or more non-elected species, are no longer withdrawn from consideration since all of the claims to this species depend from or otherwise include each of the limitations of an allowed generic claim. However, claims 7-9, directed to one or more non-elected species remain withdrawn from consideration since they do not depend upon or otherwise include all the limitations of an allowed generic claim as required by 37 CFR 1.141.

In view of the above noted withdrawal of the restriction requirement as to the linked species, applicant(s) are advised that if any claim(s) depending from or including all the limitations of the allowable generic linking claim(s) be presented in a continuation or divisional application, such claims may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 44 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

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2. An extension of time under 37 CFR 1.136(a) is required in order to make an examiner's amendment which places this application in condition for allowance. During a telephone conversation conducted on 18 January 2005, Clyde R. Christofferson requested an extension of time for TWO MONTH(S) and authorized the Director to charge Deposit Account No. 50-2041 the required fee of \$450.00 for this extension and authorized the following examiner's amendment. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

3. The application has been amended as follows:

IN THE TITLE:

The title has been amended to read as follows:

--MAGNETORESISTIVE EFFECT SENSOR WITH BARRIER LAYER
SMOOTHED BY COMPOSITION OF LOWER SHIELD LAYER--.

IN THE CLAIMS:

The claims have been amended to read as follows:

Claim 1. (currently amended) A magnetoresistive effect sensor using a shielded-type magnetoresistive effect element comprising:

a magnetoresistive effect film above a lower shield layer, said film comprising a basic configuration that is a combination of a free layer, a barrier layer, and a fixed layer, wherein either said barrier layer is formed on said free layer, and said fixed layer is formed on said barrier layer, or said barrier layer is formed on said fixed layer, and said free layer is formed on said barrier layer, said barrier layer inheriting a roughness of said lower shield layer, wherein a sensing current flows substantially perpendicularly with respect to said magnetoresistive effect film, and wherein ~~either an amorphous material or a microcrystalline material~~ is used in said lower shield layer so as to smooth said lower shield layer, thereby increasing the smoothness of said barrier layer, wherein said lower shield layer comprises a crystal grain diameter of 6.2 nm or smaller.

Claims 2-3. (canceled).

Claim 4. (currently amended) A magnetoresistive effect sensor according to claim 1, wherein said lower shield layer is formed by means of sputtering.

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Claim 5. (currently amended) A magnetoresistive effect sensor according to claim 1, wherein a said magnetoresistive effect film ~~having a basic configuration that is either a combination of a free layer, a barrier layer formed on said free layer, and a fixed layer formed on said barrier layer, or a combination of a fixed layer, a barrier layer formed on said fixed layer, and a free layer formed on said barrier layer~~ is formed on said lower shield layer directly or formed thereon via an intervening base layer.

Claim 6. (currently amended) A magnetoresistive effect sensor according to claim 1, wherein a lower conductor layer is disposed at a bottom part of a said magnetoresistive effect film ~~having a basic configuration that is either a combination of a free layer, a barrier layer formed on said free layer, and a fixed layer formed on said barrier layer, or a combination of a fixed layer, a barrier layer formed on said fixed layer, and a free layer formed on said barrier layer~~, said a bottom part of said lower conductor layer being in contact with a said lower shield layer.

Claims 7-9. (canceled).

Claim 10. (previously presented) A magnetoresistive effect sensor according to claim 1, further comprising a layer which fixes a magnetization of a fixed layer, provided so as to be in contact with said fixed layer.

Claims 11-19. (canceled).

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Claim 20. (currently amended) A magnetoresistance detection system comprising a magnetoresistive effect sensor according to claim 1, a means for generating a current passing through a said magnetoresistive effect sensor, and means for detecting a change in magnetoresistance of said magnetoresistive effect sensor as a function of a detected magnetic field.

Claim 21. (currently amended) A magnetic recording system comprising a magnetic storage medium comprising a plurality of tracks for data recording, a magnetic recording element ~~system~~ for storing data on said magnetic storage medium, a magnetoresistance detection system according to claim 20, and an actuating means ~~lined~~ connected to said magnetic recording element ~~system~~ and a magnetoresistance conversion system for the purpose of causing said magnetic recording element ~~system~~ and said magnetoresistance detection system to move to a selected track of said magnetic storage medium.

4. The following is an examiner's statement of reasons for allowance:

The prior art of record does not teach nor suggest the invention as claimed, where a magnetic tunnel junction sensor has a lower shield layer thereof made of a microcrystalline material with a crystal grain diameter of 6.2 nm or smaller.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig A. Renner whose telephone number is (703) 308-0559. The examiner can normally be reached on Tuesday-Friday 7:30 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa T. Nguyen can be reached on (703) 305-9687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Craig A. Renner
Primary Examiner
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